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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/781,125	02/08/2001	Robert L. Gerlach	F069-2	1681

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EXAMINER
SOUW, BERNARD E

ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 02/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/781,125	GERLACH ET AL.	
	Examiner	Art Unit	
	Bernard E Souw	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 February 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☒ Claim(s) *7,8,10,11 and 13* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 February 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 111(b) (provisional application) filed 02/09/2000.

Drawings

2. The drawings of Fig. 2A and 2B are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the reference sign "210" which is not mentioned in the description.

A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

3. The drawing of Fig. 6 is objected to under 37 CFR 1.83(a). The drawing must show every feature of the invention specified in the claims. Therefore, the reference signs 414, 424, 430, 432 and 440, recited on pg. 15, sect. [1040] lines 1-3, must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

4. The *abstract* of the disclosure is objected to because it contains more than 1 paragraph separated by indentation. Correction is required. See MPEP § 608.01(b).

5. The disclosure is objected to because it does not describe the reference sign "210" appearing in Fig. 2A and 2B.

Appropriate correction is required.

6. The disclosure is objected to because of the following informalities:

The specification on page 14 section [1038] line 7 recites a "***Wein** filter*", which should correctly read "***Wien** filter*".

Claim Objection

7. Claim 13 recites a "***Wein** filter*" in line 1, which should correctly read "***Wien** filter*". While applicant may be his or her own lexicographer, a term in a claim may not be given a meaning repugnant to the usual meaning of that term. See *In re Hill*, 161 F.2d 367, 73 USPQ 482 (CCPA 1947).

Claim Rejections - 35 USC § 112

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 7 and 8 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are:

The optical element *bar* (singular) providing a *common* voltage can be referred to element bar 172 shown in Fig.1 of Applicant's disclosure, recited in the specification on page 10, sect. [1027], line 1. But alternatively, it also can be referred to the optical element *bar**s*** 310 shown in Fig.3, recited on page 12, sect. [1031], lines 1-3, forming optical elements 122, 124, 126, 128 (lens #1), which have their own respective voltages.

Claim 7 recites "***an*** optical element *bar* to provide a *common* voltage to the optical elements within the gun chamber". The *singular* form of this *bar*, supported by the word "***common*** *voltage to optical elements*" (plural) implies a single bar element for all, i.e., reference sign 172 in Fig.1, recited in the specification on page 10, sect. [1027], line 1. Otherwise, the wording "***reference*** *voltage*" would be more appropriate.

However, this contradicts claim 8, which recites "*optical elements are placed **in** the optical element bar to allow independent control of ... optical elements ...*", which implicates a plurality of bars, i.e., more likely meaning *conductor bar**s*** 310 shown in Fig.3, which form the optical elements 122, 124, 126, 128 (lens 1), as recited on page 12, sect. [1031], lines 1-3. In any case, it would be principally impossible to place "*optical elements **in** the optical element bar*" (*singular*) since the latter has a single *common* voltage for all.

Applicant is required to use claim language and terminologies in the specification that clearly and unambiguously point out the particular elements recited in the claims, including their respective functions.

To proceed with this Office Action, the conductor bar in claim 7 is assumed to have a single common voltage, and the optical element bar of claim 8 is assumed by the Examiner to be the optical bars (plural) 310 shown in Fig.3 that form the elements 122, 124, 126, 128 of lens 1, each lens and each element having their own voltage.

10. Claims 10 and 11 recite the wording *"biased to (a voltage of a) and/or (the same) polarity (opposite to) and/or (as) that of the charge of the secondary particles"*. It is generally known in the art that a voltage or a polarity does not cause any acceleration to a charged particle; but an electric field does, the latter being defined *not* by a voltage or polarity applied to a *single* pole element, as recited in the claim, but by a potential *difference* across the space where the acceleration is desired. This requires at least *two* pole elements. It does not really matter, whether one or both of the poles are either positive or negative, as long as the electric field created there between is in the proper direction.

The recitation which follows, i.e., "*so as to accelerate the charged particles up through and past the lens ... for detection*", would have been sufficient to describe the claim(s), but in the current formulation it is obscured by the preceding recitation that has an indefinite meaning: an acceleration can still be obtained under violation of the previously recited indefinite limitation.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 1, 4-6, and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. (USPAT # 4,902,898) in view of Stengl (USPAT # 4,985,634).

13. Regarding claim 1, Jones et al. invent an apparatus including multiple ion guns and multiple associated optical columns for focused ion beam (FIB) processing of materials or imaging, comprising:

- one or more ion gun chambers, addressed as one of the "*monolithic ion source*" recited in the Abstract, last paragraph, lines 4-5 from bottom, and more specifically as ion source 182 shown in Fig.10, recited in Col.9/ll.8-15;
- one or more ion guns (sources) 190 positioned within each of the one or more ion gun chambers 182 shown in Fig.10, as recited in Col.9/ll.14-25, or – in case of a single ion source -- ion gun chamber 22 shown in Fig.1, as recited in Col.2/ll.61-68, each of the ion gun chambers 22 (or 182) capable of generating an ion beam, as recited in Col.2/ll.63-65.

However, Jones's ion source 182/Fig.10 and 22/Fig.1 is not expressly described in the disclosure as being *sealed*, although the sealed condition is inherent in Jones's due to the subsequent high vacuum region 194 including the array column 184, as recited in Col.9/ll.9/ll.20-25.

Stengl et al. disclose an ion gun 12 shown in Fig.2 that forms a chamber separated (i.e., vacuum-isolated) from the subsequent optical column. As such, Stengl's ion gun is essentially sealed, more specifically vacuum-sealed by vacuum-valve 36 shown in Fig.2, as recited in Col.9/ll. 46-50.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Stengl's ion gun 12 of Fig.2 for Jones's ion source 182 of Fig.10, since Stengl's ion gun is also used in a focused ion beam column device similar to Jones's for the same purpose of ion beam lithography.

One would have been motivated to use Stengl's ion gun in place of Jones's ion source, since Stengl's ion gun, for being a conventional low pressure ionization source, is capable of handling a larger variety of gas species than Jones's diffusion-based device.

Jones's apparatus (as modified by Stengl's) further comprises:

- multiple ion optical columns 20 shown in Fig.1, which is equivalent to optical column 128 shown in Fig.7, each optical column being associated with one of the multiple ion guns for focusing and directing the corresponding ion beam toward a target 44 in Fig.1, as recited in Col.2/ll.67-68 & Col.3/ll.1-2, or the top plate (unlabeled) in Fig.7, as recited by Jones et al. in Col.7/ll.61-65;

- a primary vacuum chamber 194 shown in Fig.10, equivalent to the vacuum housing containing ion beam column 20 and deflectors assembly 46 shown in Fig.1, as recited in Col.3/ll.36-39, for containing a target 44 for processing, as recited Col.3/ll.30-35, for processing or imaging, as recited in Col.3/ll.19-24 and Col.3/ll.24-30, respectively.

- Stengl's also shows in Fig.2 an ion optical column 14 shown in Fig.2, as recited in Col.8/ll.41-46 and Col.9/ll.20-25, as well as a target 248.

Stengl's modification of Jones's device further shows:

- a vacuum valve 36 associated with each of the ion guns shown in Fig.2, as recited in Col.9/ll. 46-50.

- Although not specifically recited, it would have been a mere matter of design choice to selectively open Stengl's vacuum valves 36 to allow the ion beam to pass from the ion gun to the target, or selectively closing to seal the ion chamber, since the motivation is obvious and the skill therefor required is only routine in the art.

14. Regarding claim 4, the use of a vacuum pump for (each) ion gun chamber is inherent in Stengl, as implicated by the vacuum condition recited in Col.9/ll. 46-50.

15. Regarding claim 5, the use of a single control to open and close (all) the vacuum valves is a mere matter of design choice that only involves routine skill in the art, and hence, unpatentable.

16. Regarding claim 6, the use of a deceleration lens element maintained near ground potential is rendered obvious by Stengl in Col.14/ll.20-22 and Col.14/ll.43-46, wherein the motivation and necessity regarding a ground potential is expressly given by Stengl in Col.13/ll.25-19.

17. Regarding claims 17-19, all the limitations are conventional for FIB columns, and hence, inherent in both Jones's and Stengl's. See e.g. Jones's Col.3/ll.68 & Col.4/ll.1-11 and Col.9/ll.32-68 & Col.10/ll.1-17, as well as Stengl's Col.8 to Col.28.

18. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. in view of Stengl, as previously applied to parent claim 1, and further in view of Mack (USPAT # 6,222,196 B1).

The limitation regarding beam column tilt is inherent in Jones's, addressed by the parameter θ as part of the x,y,θ scan, as recited in Col.3/ll.5-25. However, a beam tilt of about three degrees is expressly recited by Mack in Col.6/ll.12-42 in reference to Fig.4A & 4B. It would have been obvious to one of ordinary skill in the art at the time the invention was made to tilt the beam(s) by about three degrees, since this amount of tilt is known to be appropriate with regard to the purpose thereby envisioned.

Mack may have made his about 0 to 10 degree beam tilt for a purpose different than Applicant. However, Applicant's differing purpose does not alter the conclusion that Applicant's use of a prior art device (Jones's & Stengl's as modified by Mack),

would be *prima facie* obvious from the purpose disclosed in the reference. *In re Lintner*, 173 USPQ 560.

19. Claims 2, 3, 7, 8 and 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. in view of Stengl, as previously applied to parent claim 1, and further in view of Ngo et al. (Proceeding 43rd International Conference on EIPBTN).

► Regarding claims 2 and 3, Jones et al. as modified by Stengl shows all the claim limitations, except the recitation that a single ion gun chamber may contain one or more ion guns.

► Regarding claim 2, Ngo et al. disclose a sealable ion gun chamber shown in Fig.1 equipped with a multiple of extraction holes, as seen in Fig.1 and recited on pg.241, third paragraph/section.

Specifically regarding claim 3, the recitation of a multiple sealable ion gun chambers each including one or more ion guns is a mere duplication of parts. The court held that mere duplication of parts has no patentable significance unless a new and unexpected result is produced. *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960).

► Insofar the Examiner can ascertain beyond the above rejection under the second paragraph of 35 U.S.C. 112, claims 7 and 8 are rejected as being unpatentable over Jones et al. in view of Stengl, and further in view of Ngo et al.

Jones et al. as modified by Stengl, and further modified by Ngo et al. show all the limitations of claim 7, including the use of a conductor bar to provide a reference voltage, as shown in Ngo's first one of the two perforated electrodes shown in Fig.1, which is entirely made of copper, and hence, is on a single potential, as recited on pg. 241, 3rd paragraph, lines 3-4.

Jones et al. as modified by Stengl, and further modified by Ngo et al. show all the limitations of claim 8, including the use of a second of the two perforated electrodes shown in Fig.1, of which only the beam passage is coated with copper, thus allowing the beamlets to be individually switched on and off, as recited on pg.241, 3rd paragraph, lines 4-8, or alternatively, to allow independent control of the optical elements, as known to one of ordinary skill in the art.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Jones's and Stengl's ion gun by Ngo's teaching of using two perforated plate electrodes to produce a multiple ion beam column of controlled pattern, since a multiple of electrostatic lenses that can be separately controlled can be formed by applying different potentials to the holes of the second plate, as suggested by Ngo et al. on page 241, 3rd paragraph, lines 4-8.

▶ Regarding claims 20-23, Jones et al. as modified by Stengl and Ngo et al. show all the claimed limitations, as previously applied to claims 7 and 8.

20. Claims 9-11 and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. in view of Stengl, and further in view of Lo et al. (USPAT # 6,232,787).

Jones et al. as modified by Stengl show all the limitations of claim 9, as previously applied to the parent claim 1, except the recitation of multiple lens elements and further comprising a means for collecting secondary particles through a lens element for imaging or characterizing the target surface.

Multiple lens elements are inherent in Jones's, as shown by elements 48 and 50 in Fig.1 and recited in Col.3/ll.29-32. Multiple lens elements are also inherent in Stengl's, as shown by element 196 in Fig.2b and recited in Col.12/ll.34-37.

Lo et al. disclose a charged particle beam system for inspecting a target wafer surface, as recited in the Abstract. Lo's CPB imaging system comprises a means (detector 132 in Fig.1) for collecting secondary particles through a lens element 126, as recited in Col.4/ll.ll.23-34 and ll.39-65.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a means for collecting secondary particles as suggested by Lo et al., since forming an image from collected secondary particles emitted by the irradiated surface is conventional to many CPB systems.

It would have been further obvious to one of ordinary skill in the art at the time the invention was made to collect the secondary particles through the same lens element used for focusing and deflecting the primary ion beam (column), so the two

types of particles can be automatically separated based on their electrical charge, as also suggested by Lo et al.

21. Insofar the Examiner can ascertain beyond the above rejection under the second paragraph of 35 U.S.C. 112, the recitations of deflector in claim 10 is rendered obvious by Stengl's in Col.14/ll.14-51, and the recitation in claim 11 regarding lens element(s) that accelerate the charged secondary particles through the lens element for detection, is rendered obvious by Lo et al. in Col.4/ll.ll.23-34 and ll.39-65.

22. Insofar the Examiner can ascertain beyond the above rejection under the second paragraph of 35 U.S.C. 112, Jones et al. as modified by Stengl and Ngo et al. show all the limitations of claim 13, as previously applied to the parent claim 9, including the use of a combination of magnetic and electrostatic field deflector, as recited in Col.4/ll.23-35, acting as a filter for mass & velocity, as generally known in the art.

23. Specifically regarding claim 14, the use of a mass spectrometer for detecting and characterizing the secondary charged particles, i.e., as a specific form of filter for mass and velocity as in claim 13, is a mere matter of design choice, which is here not patentable, since it only involves routine skill in the art.

24. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. in view of Stengl and Lo et al., further in view of Krans et al. (USPAT # 6,218,664 B1).

Jones et al. as modified by Stengl and Lo et al. show all the limitations of claim 12, as previously applied to the parent claim 9, including Lo's detector 132 shown in Fig.1, which is a photomultiplier- scintillator combination recited in Col.4/ll.32-34, except the additional limitation of a center hole for the primary hole to pass through.

Krans et al. disclose a secondary electron detector 8 & 6 shown in Fig.1 &2, having a center hole for the primary hole to pass through, as recited in Col.4/ll.65-67.

25. Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. in view of Stengl and Ngo et al., as previously applied to claims 20-23, and further in view of Lo et al. (USPAT # 6,232,787).

Regarding claim 24, Jones et al. as modified by Stengl and Ngo et al. show all the claim limitations, except of some limitation specific to the parent claim 20, which has been rendered obvious by Lo et al.. This includes the recitation of a means for collecting secondary particles through a lens element for imaging or characterizing the target surface, as previously applied to claims 9 and 20.

Regarding claim 25, the application of a high bias voltage to the emitter & suppressor elements is conventional and inherent in Jones's and Stengl's, as generally known in the art. Regarding a specific voltage of 2000 V, this Official Notice is supported by McKenna et al., as disclosed in Col.6/line 39.

Double Patenting

26. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-24 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-26 of copending Application No. 09/780,876 (Patent Application Publication US 2001/0032938 A1). Although the conflicting claims are not identical, they are not patentably distinct from each other because:

- Claims 1 and 12 in combination are obvious over claim 1 of the copending Application, further interpreted in light of its specification, i.e., paragraph [1010] reciting the duplication and/or multiplication of ion gun(s) to form the limitations of claims 1 & 12 of the current application, i.e., ion beam column;
- Claim 12 is obvious over claims 5, 14, and 23 of the copending Application,
- Claim 11 is obvious over claim 2 of the copending Application;
- Claims 9 is obvious over claim 3 of the copending Application;

- Claim 10 is obvious over a combination of claims 9 and 24 of the copending Application;
- Claim 13 is obvious over a combination of claims 4 and 22 of the copending Application;
- Claim 12 is obvious over claim 6 of the copending Application;
- Claim 6 is obvious over a combination of claim 7, 8, 10, 11, 25 and 26 of the copending Application;
- Claims 7 and 9 in combination are obvious over specific combinations of claims 10 and 11 of the copending Appl.;
- Claim 20-23 are obvious over various combinations of claims 13-19 of the copending Application.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

27. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bernard E Souw whose telephone number is 703 305 0149. The examiner can normally be reached on Monday thru Friday, 9:00 am to 5:00 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R Lee can be reached on 703 308 4116. The fax phone numbers for

the organization where this application or proceeding is assigned are 703 872 9318 for regular communications and 703 872 9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 0956.

bes
January 25, 2003

JOHN R. LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800